Palmer Design/Build Report

Whitley County, Indiana

May 2003

Prepared for:

Lynn Stevens
Tippecanoe Environmental and
Lake Watershed Foundation
P.O. Box 55
North Webster, IN 46555
574-834-3242

Prepared by:

708 Roosevelt Road
Walkerton, Indiana 46574
574-586-3400

PALMER DESIGN/BUILD REPORT
EXECUTIVE SUMMARY

This project addresses excessive sediment loading and associated nutrients to the Lake Tippecanoe watershed from the Cedar Lake Branch of Elder Ditch in Whitley County, Indiana. The primary goal of the project was to reduce sediment and nutrient loading by 50% from a deteriorated agricultural tile that runs through the property of Michael and Yvette Palmer. To accomplish this goal, the 24-inch deteriorated drain tile was rerouted through a newly constructed sediment trap and restored wetland. A water level control structure was also installed to increase detention time allowing greater amounts of suspended sediment to drop out of the water column. This project was made possible in part by the cooperation of the landowner, Tippecanoe Environmental and Lake Watershed Foundation (TELWF), and funding from the Indiana Department of Natural Resources' Lake and River Enhancement (LARE) design/construction fund.

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PALMER DESIGN/BUILD REPORT
WHITLEY COUNTY, INDIANA

1.0 PROJECT DESCRIPTION AND PURPOSE

The project site is located on the property of Michael and Yvette Palmer at 580 North State Road 5 near Larwill in Whitley County, Indiana (Figure 1). The project involved intercepting a 24-inch tile that drained predominately agricultural land directly into the Cedar Lake Branch of Elder Ditch, a tributary of Grassy Creek, which is a major tributary of the Tippecanoe River. The concrete and clay tile had deteriorated causing sinkholes to form in the agricultural fields, which allowed unfiltered runoff to enter the Cedar Lake Branch of Elder Ditch. The purpose of the project was to reduce the delivery of sediment and associated nutrients to the Cedar Lake Branch of Elder Ditch by rerouting the tile through a sediment trap and wetland filter prior to it entering the waterway. A partially drained wetland that had been adjacent to the existing drain tile was restored to promote nutrient uptake and further reduce suspended sediment loads during high flow events. The project is part of a watershed-wide effort to improve the water quality with the Lake Tippecanoe watershed

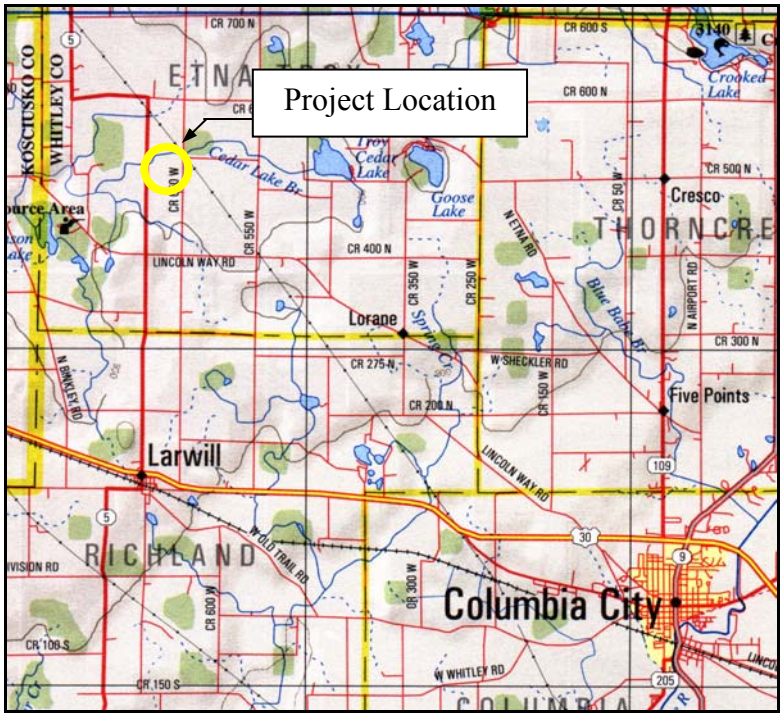


Figure 1. Palmer project location.

2.0 DESIGN RATIONAL

The project was designed to remove suspended sediments and associated nutrients by routing water from the tile through a series of settling basins separated by vegetated shallow zones before flowing into the Cedar Lake Branch of Elder Ditch. The design also allowed water collected within the sediment trap to inundate an adjacent wetland during high precipitation events to remove additional sediment and nutrients. This design allowed greater sediment and nutrient removal than would have occurred by simply repairing the existing drain tile as some of the sediment in the system was due to the common use of tile risers that carry surface runoff

directly to the drain tile. A water level control structure was installed at the downstream end of the sediment trap and wetland filter to increase retention time during high flow events; allowing more time for suspended sediments to drop out.

3.0 DESIGN AND CONSTRUCTION SPECIFICS

3.1 PERMITTING

The original design plans called for excavation of a portion of the existing wetlands. Permits were applied for through the Corps of Engineers (COE) and the Indiana Department of Environmental Management (IDEM) for the original design. When it became clear that IDEM would not issue a permit for affecting the wetland the design was changed to eliminate all wetland impacts and the IDEM application was withdrawn (Appendix A). No permits were then required from the IDEM or the COE since excavation occurred outside the identified wetland boundary. An exemption was received from the Indiana Department of Natural Resources for Flood Control Act permitting requirements. The Whitley County Drainage Board approved the project in March 2002. Permit correspondence is contained in Appendix A.

3.2 POND EXCAVATION

The series of pools and the shallow areas between were excavated adjacent to the existing wetland (Figure 2). Excavated material was spread in the spoils area shown in Figure 2. Pools were constructed with a maximum depth of 12 feet. Two pools were excavated in the upper 1/3 of the sediment trap and the last pool was constructed near the water control structure. The project was designed to have water depths of one-foot in the lower 1/3 of the sediment trap. A scaled site plan can be found in Appendix B.

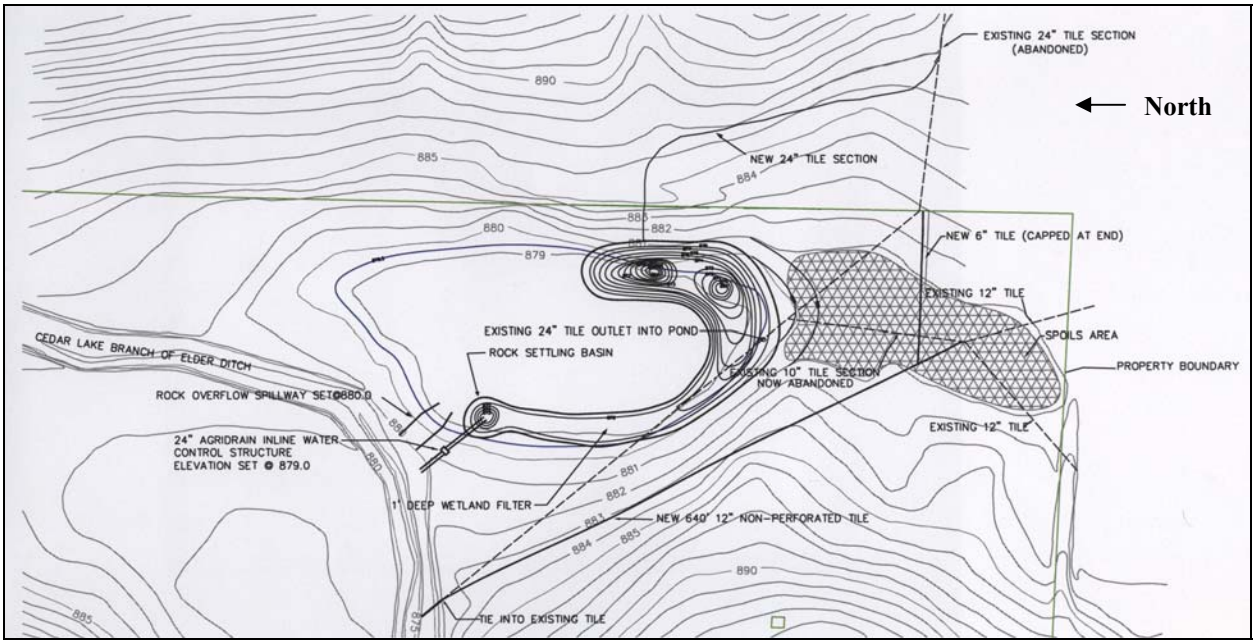


Figure 2. Palmer sediment trap site plan. Note: Figure not to scale.

3.3 WATER CONTROL STRUCTURE

A 6-foot, 24-inch AgriDrain Inline Water Control Structure (fit for dual-walled tile) was installed to increase detention time within the sediment trap (Figure 3). Water flowing through the sediment trap enters the water control structure via a 90-foot solid non-perforated 24-inch tile. The water level is controlled by a series of removable stop logs within the structure. The water level control structure is designed to retain water within the settling basin for 48 hours. Four, 2-inch diameter holes were drilled into one of the stop logs to maintain a normal pool elevation of 878 feet. The four holes in the stop log slow the release of water from the filter during runoff events, which allows greater detention time and better retention of sediments and nutrients in the treatment area. The original design called for six, 3-inch diameter holes to be drilled into one of the stop logs. However, observed flow rates through the six holes were higher than calculated. The four 2-inch holes proved adequate to lower the elevation to normal pool within 48 hours.

The control structure currently has a high water level elevation setting of 879.5 feet for high precipitation events. An overflow spillway was constructed adjacent to the control structure to release water from the sediment trap and wetland filter at an elevation of 880 feet into the ditch. The elevation of the spillway does not allow water to back into the source tile. The overflow spillway is 50 feet wide and is armored with rock over 7-ounce non-woven geotextile filter fabric. Water exiting the structure flows through a 30-foot solid non-perforated 24-inch tile before entering the ditch. Twenty tons of rocks were placed over 7-ounce non-woven geotextile filter fabric at the outlet to prevent erosion. Animal guards were installed at the inlet and outlet of the water control structure. Water control structure design details are included in Appendix B. Engineering calculations for the water control structure are included in Appendix C.

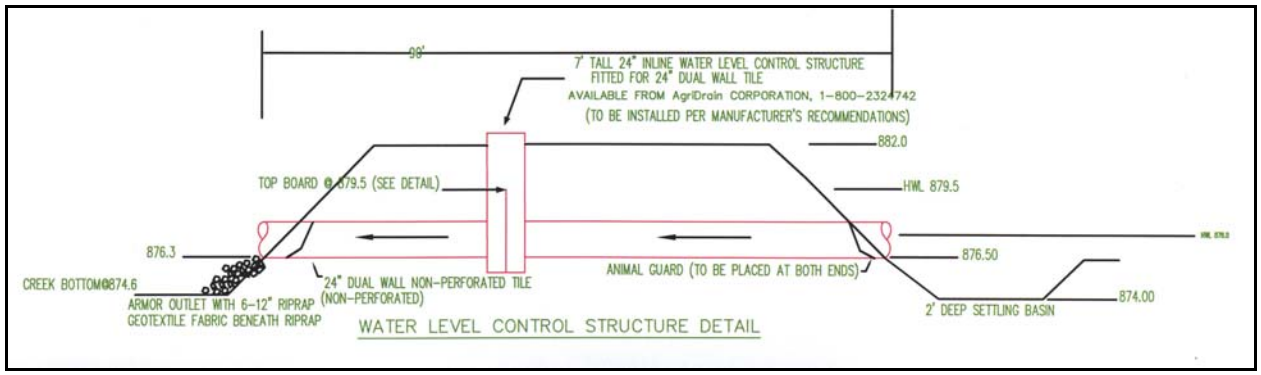


Figure 3. Water level control structure.

3.4 DRAINAGE TILES

Approximately 650 feet of deteriorating 24-inch clay and concrete tile draining the adjacent agricultural fields and the on-site wetland was replaced with 24-inch dual wall non-perforated tile (Figure 2). The new tile was routed into the sediment trap and wetland filter over a rock-armored outfall underlain with 7-ounce non-woven geotextile fabric. The deteriorated 24-inch clay and concrete tile was crushed and buried on site. 640 feet of 12-inch non-perforated tile was also installed to drain the adjacent property to the south directly into the ditch. The new 12-inch tile connects to existing 12-inch tiles on the property. 180 feet of perforated 6-inch tile was connected into the 640 feet of 12-inch tile approximately 155 feet south of the wetland. The upslope end of the perforated 6-inch tile was capped and may be used to drain the adjacent

farmland in the future. The Whitley County Drainage Board authorized and funded the replacement of an additional 650 feet of tile upstream from the project site.

3.5 NATIVE PLANTINGS

One acre of prairie buffer was planted around the southern and western boundaries of the sediment trap and wetland filter. Disturbed upland areas were planted with a mix of native species designed to stabilize the areas. A variety of emergent wetland plants and trees were placed around the perimeter of the sediment trap. Cattails (*Typha* sp.) were planted in the shallows of the lower 1/3 of trap south of the final pool. Additionally, three weeping willows were planted in the southeastern side of the sediment trap. A complete planting list is included in Appendix D.

4.0 CONSTRUCTION SCHEDULE

Bids were sent out in May 2002 for the construction of the sediment trap and water control structure. Construction of the sediment trap and water control structure was completed in July 2002. Rerouting of the drainage tiles, tile outfall construction, and demolition of the deteriorated tile was completed in December 2002. Native plantings within the sediment trap/wetland filter were originally scheduled for 2002 after the excavation of the sediment basin. However, drought conditions delayed the plantings until April 2003. All plantings were completed by May 2003.

5.0 MONITORING AND MAINTENANCE ACTIVITY

Dredging of the three basins within the sediment trap will be necessary in the future to maintain the project's functionality. Water levels within the sediment trap should be observed after occasional rain events to determine if adjustments need to be made to the stop logs. Additional holes can be added or plugged as needed. The tile inlet and outlet animal guards will also need to be kept clear of debris to maintain proper flow rates. During a Spring 2003 site visit following a heavy precipitation event, the project was observed to be functioning as designed. No analysis of sediment or nutrient removal was contracted as part of this project.

6.0 PROJECT SUMMARY

The overall purpose of this project was to improve water quality within the Lake Tippecanoe watershed by reducing sediment and associated nutrients delivered to the Cedar Lake Branch of Elder Ditch (Grassy Creek). This goal will be accomplished by rerouting a 24-inch diameter field tile through a sediment trap and wetland filter prior to it entering the waterway. A wetland adjacent to the sediment trap was restored to promote nutrient uptake and further reduce suspended sediment loads during high flow events. During a Spring 2003 site visit following a significant precipitation event, the sediment trap appeared to be removing suspended sediments delivered to the basin from the drainage tile. Only a small, dilute plume of suspended sediment was entering the Cedar Lake Branch of Elder Ditch compared to a steady stream of muddy water from the drain tile. The functionality of the sediment trap will be further enhanced once the native emergent plantings have had the opportunity to establish themselves. Maintenance dredging of the sediment trap will be a necessity in the future if the project is to be a lasting success.

APPENDIX A
PERMIT LETTERS

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We make Indiana a cleaner, healthier place to live

Frank O'Bannon
Governor

Lori F. Kaplan
Commissioner

100 North Senate Avenue
P.O. Box 6015
Indianapolis, Indiana 46206-6015
(317) 232-8603
(800) 451-6027
www.state.in.us/idem

Ms. Lynn Stevens
TELWF
P.O. Box 55
Webster, Indiana 46555

September 3, 2002

Dear Ms. Stevens:

Re: Section 401 Water Quality Certification Application
Project: TELWF-Palmer Property Wetland Restoration
IDEM ID #: 2002-171-92-LPR-A
COE ID #: 200200454-aka
County: Whitley

Office of Water Quality Staff received your agent's request for the withdrawal of the above-referenced application on July 12, 2002. The request is granted based on the information that the wetland restoration project will not involve soil disturbance of the existing adjacent wetland, and will only entail flooding and planting.

If you have any questions about this correspondence, please contact Marylou Renshaw, Project Manager, of my staff at 317-234-1221 or you may contact the Office of Water Quality through the IDEM Environmental Helpline (1-800-451-6027).

Sincerely,

Dennis E. Clark

Dennis E. Clark, Ph.D
Section Chief
Water Quality Standards Section
Office of Water Quality

cc: Amy Sharp, COE-Louisville District, Indianapolis Field Office
Brian Majka, J.F. New & Associates

DNR Indiana Department of Natural Resources

Frank O'Bannon, Governor
John Goss, Director
Division of Water
402 W. Washington Street
Room W264
Indianapolis, IN 46204-2641
PH: (317) 232-4160
Toll-Free 877-928-3755
FAX: (317) 233-4579

May 6, 2002
Basin #5

JF New & Associates
Brian Majka
708 Roosevelt Road
PO Box 243
Walkerton, IN 46574-0243

CTS-1059- Wetland Exemption
Whitley County – Lorane
Cedar Lake Branch

Dear Mr. Majka:

Thank you for your letters received by the Division of Water on March 11, 2002, April 12, 2002 and May 2, 2002 regarding your intent to restore wetlands in Whitley County. Your construction project, outlined in the information submitted, qualifies for an exemption as outlined under 312 IAC 10-5-1 and is therefore exempt from the permitting requirements of the Flood Control Act.

You should not construe this letter to be a building permit, approval of the proposed project, or a waiver of the provisions of local building or zoning ordinances. Additionally, this letter does not relieve you of the responsibility of obtaining permits, approvals, easements, etc. as required by other federal, state, or local agencies.

The Division of Water will retain a copy of this letter in our files as a permanent record.

Thank you for this opportunity to be of assistance; your interest in providing safe floodplain management is appreciated. If you have any further questions concerning this matter, please contact Beth Tallon, Environmental Scientist, Division of Water, at (317) 232-4160 or toll free at 1-877-928-3755.

Sincerely,

James Hebenstreit, PE
Assistant Director
Division of Water

JJH/BLT
Pc: Detroit Corps of Engineers
White County Plan Commission
Division of Law Enforcement
Division of Fish and Wildlife

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, LOUISVILLE
CORPS OF ENGINEERS
INDIANAPOLIS FIELD OFFICE
9799 BILLINGS ROAD
INDIANAPOLIS, INDIANA 46216-1055
FAX: (317) 532-4228
http://www.lrl.usace.army.mil

April 3, 2002

Operations Division
Regulatory Branch (North)
ID No. 200200454-aka

Ms. Lynn Stevens
Tippecanoe Environmental Lake and Watershed Foundation
P. O. Box 55
North Webster, Indiana 46555

Dear Ms. Stevens:

This is in regard to your application requesting authorization to mechanically clear approximately 0.5 acres of a 1.1-acre jurisdictional wetland and to excavate the remaining 0.6 acres using a one-step removal method. That area excavated will be excavated to a depth of approximately 10 feet. We have reviewed the submitted data to determine whether a Department of the Army (DA) permit will be required under the provisions of Section 404 of the Clean Water Act.

Regarding the proposed excavation of the 0.6 acres, we have determined that this part of your project will not require authorization from us. Although jurisdictional waters would be impacted by this project, the activity is not regulated. Changes in our regulations, effective July 9, 1998, allow for the removal of sediment and other obstructions, involving only the incidental fallback of dredged material. Therefore, a DA permit will not be required from us provided a one step removal method is used. If the method by which this work would be performed should change and would not use a one step removal method, please contact this office for further information, as a DA permit may be required.

One step removal requires that the sediment and debris must be removed and immediately placed landward sufficiently enough to prevent the runoff water from the dredged material from re-entering the stream and that no additional dredged and/or fill material is placed below the ordinary high water mark of the stream or in wetlands. We recommend, however, that good management and conservation practices be used. For example:

a. The dredged (excavated) material should be placed sufficiently landward in a contained manner and immediately stabilized by spreading and seeding;

b. Straw or hay bale barriers or other approved berming methods for controlling and containing sediment should be used if the dredged material is discharged within close proximity to any ''waters of the United States;''

c. The side casting of dredged material into wetlands adjacent to the stream is not allowed under one step removal and would require authorization before the work is done.

Implementing best management practices will help to ensure that those one step removal activities being performed in ''waters of the United States'' that does not require authorization will not contribute to any significant degradation to the aquatic environment.

The mechanical clearing of the 0.5 acre of jurisdictional wetlands would qualify for Nationwide authorization under 33 CFR 330 (27), Stream and Wetland Restoration Activities, as published in the Federal Register January 15, 2002, provided you comply with the enclosed Terms for Nationwide Permit No. 27 and the Nationwide Permit General Conditions, and the following special condition:

1. Planting of only native species should occur on the site.

2. A vegetated buffer approximately one acre in size shall be constructed around the perimeter of the 1.1-acre jurisdictional wetland.

3. An individual Water Quality Certification (WQC) must be obtained from the Indiana Department of Environmental Management. A copy of the WQC must be provided to this office prior to commencement of construction.

This authorization will be effective as soon as we receive your signed acceptance of the conditions and a copy of the WQC. Please sign and date the duplicate copy of this letter in the space provided and return the signed copy in the enclosed envelope. Note that we also perform periodic inspections to ensure compliance with our permit conditions and applicable Federal laws.

A copy of this letter will be forwarded to the IDEM and to Mr. Brian Majka; J.F. New & Associates, Inc.; 708 Roosevelt Road; Walkerton, Indiana 46574.

If you have any questions, please contact this office by writing to the above address, ATTN: CEORL-OP-FN or by calling me at (317) 532-4198. Any correspondence on this matter should refer to our ID No. 200200454-aka.

Sincerely,

ORIGINAL SIGNED

Amy K. Allen
Project Manager
Regulatory Branch

Enclosure

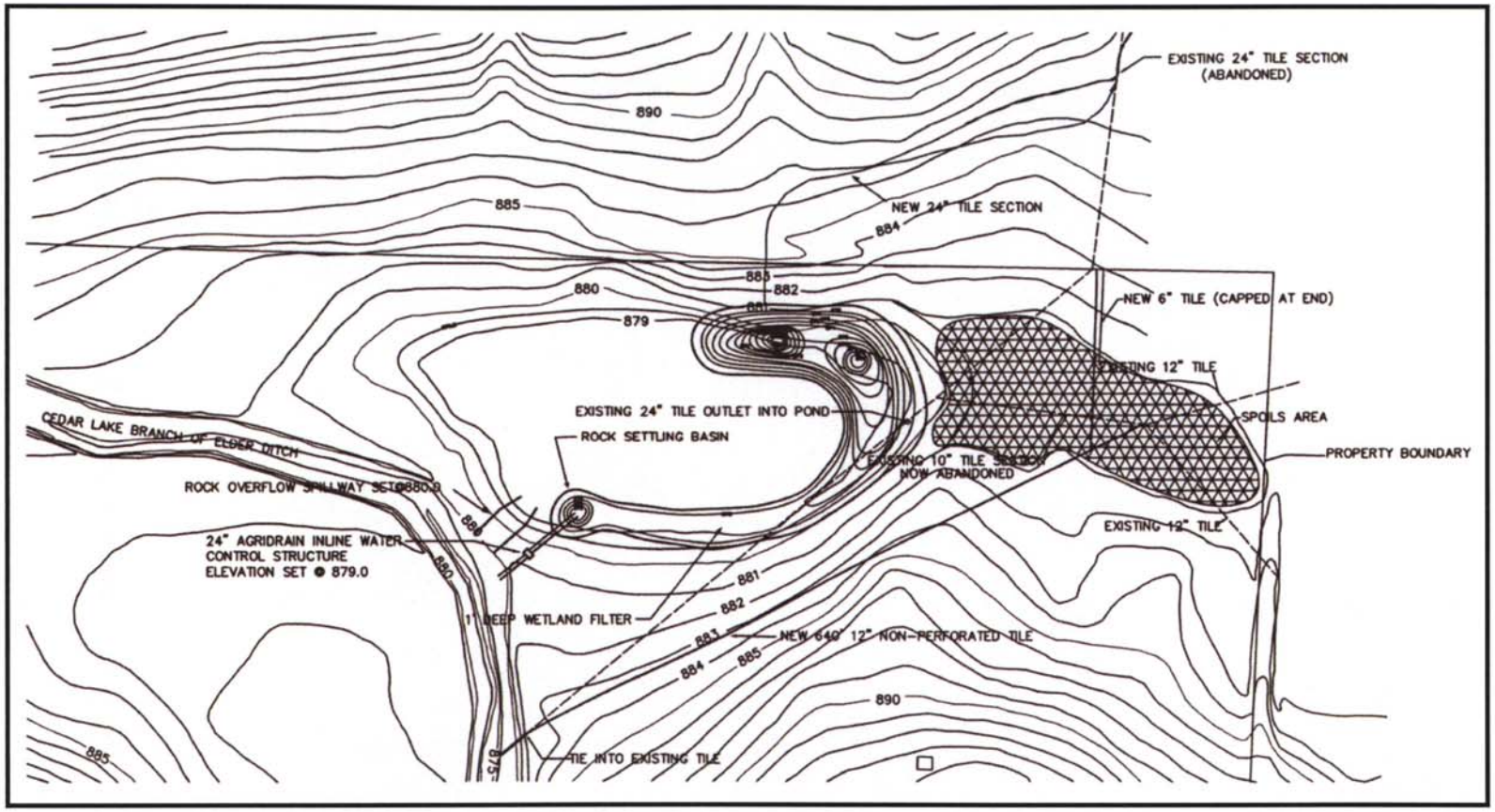
(I accept the conditions of this authorization)

Lynn Stevens

Date

Allen/OP-FN/conditionnwp.wp.A1

APPENDIX B
SITE PLANS AND DESIGN DETAILS



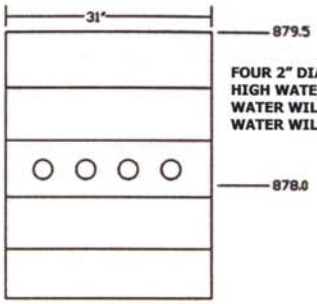
Site Plan
Palmer Sediment Trap/Wetland Restoration
Whitley County, Indiana

N

Scale: 1" = 150'

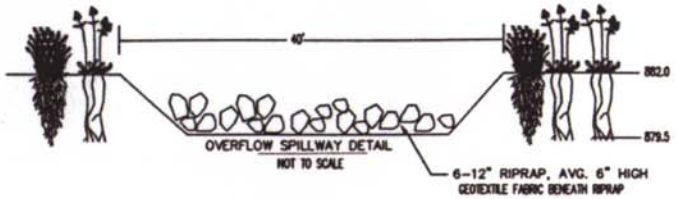
JFN # : 98-10-28/01

JFNew
708 Roosevelt Road, Walkerton, IN 46574
Phone 574-586-3400 / Fax 574-586-3446
www.jfnew.com



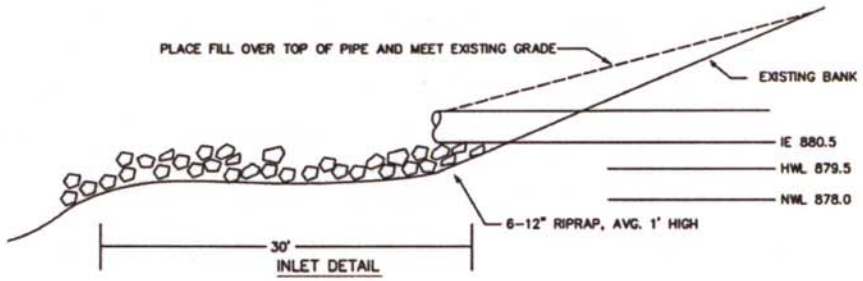
FOUR 2" DIAMETER HOLES DRILLED, INV. 878.0
HIGH WATER LEVEL WILL BE 879.5
WATER WILL SLOWLY DRAIN TO 878.0
WATER WILL BE RETAINED FOR 48 HRS

STOP LOG DETAIL
NOT TO SCALE



OVERFLOW SPILLWAY DETAIL
NOT TO SCALE

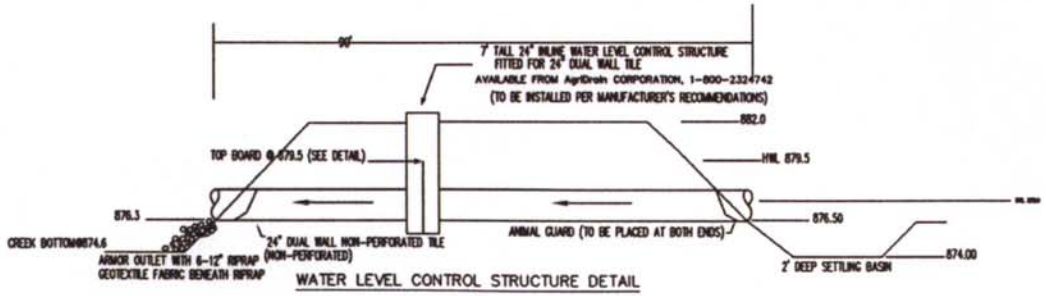
6-12" RIPRAP, AVG. 6" HIGH
GEOTEXTILE FABRIC BENEATH RIPRAP



INLET DETAIL

24" ANIMAL/TRASH GUARD
AVAILABLE FROM AgrDrain CORPORATION, 1-800-2324742

ANIMAL GUARD DETAIL
NOT TO SCALE



WATER LEVEL CONTROL STRUCTURE DETAIL

Design Details
Palmer Sediment Trap/Wetland Restoration
Whitley County, Indiana

NOT TO SCALE

JFN #: 98-10-28/01

JFNew
708 Roosevelt Road, Walkerton, IN 46574
Phone 574-586-3400 / Fax 574-586-3446
www.jfnew.com

APPENDIX C
WATER CONTROL STRUCTURE ENGINEERING CALCULATIONS

Wetland Orifice Flow Control

Configuration 1

Base Flow	0.0	cfs
High Water Head above Orifice	18	inches
Average area	1.8	acres
High Water Storage Volume	918550	gallons
Number of Orifices	6	
Orifice Diameter	3	in

Orifice Flow Summary

Head Above Orifice (ft)	Storage (gallons)	Orifice Outflow (gpm)	Base Inflow	**Net Outflow (gpm)**	Incremental time (hours)	Total time (hours)
1.50	153092	779	0	**779**	3.3	3
1.25	153092	711	0	**711**	3.6	7
1.00	153092	636	0	**636**	4.0	11
0.75	153092	551	0	**551**	4.6	16
0.50	153092	450	0	**450**	5.7	21
0.25	153092	318	0	**318**	8.0	**29**

Configuration 2

Base Flow	0.5	cfs
High Water Head above Orifice	18	inches
Average area	1.8	acres
High Water Storage Volume	918550	gallons
Number of Orifices	6	
Orifice Diameter	3	in

Orifice Flow Summary

Head Above Orifice (ft)	Storage (gallons)	Orifice Outflow (gpm)	Base Inflow	**Net Outflow (gpm)**	Incremental time (hours)	Total time (hours)
1.50	153092	779	-234	**545**	4.7	5
1.25	153092	711	-234	**477**	5.4	10
1.00	153092	636	-234	**402**	6.3	16
0.75	153092	551	-234	**317**	8.1	24
0.50	153092	450	-234	**216**	11.8	36
0.25	153092	318	-234	**84**	30.5	**67**

Maximum Net Influent/Effluent Tile Flow Estimate - Assumes Zero Pipe Length Condition (No Friction Loss)

	Maximum Head (ft)	Tile (in) 24	
Influent Tile	3.30	12326	gpm
Effluent Tile	0.50	4798	gpm
Net Flow		**7528**	**gpm**

Rational Method Runoff Estimate (10-year storm)

Watershed Area	20	acres
Runoff Coefficient (Row Crops)	0.31	
Rainfall Intensity	3	in/hr
Estimated Runoff	18.6	cfs

Spillway Discharge During 10-year Storm

Net Influent	35	cfs
Spillway Width	20	ft
Unit Flow	1.7	cfs/ft
Critical Depth (flow depth over spillw	0.46	ft
Backwater Depth above Spillway	0.69	ft

APPENDIX D
PLANTING LIST

WETLAND PLANTING MIX

Common Name	Botanical Name
Bristly Sedge	*Carex comosa*
Common Rush	*Juncus afinis*
Blue Lobelia	*Lobelia siphilitica*
Monkey Flower	*Mimulus rigens*
Obedient Plant	*Physostegia virginiana*
Pickerel Weed	*Pontederia cordata*
Hardstem Bulrush	*Scirpus acutus*
Arrowhead	*Sagittaria latifolia*
Lizard's Tail	*Saururus cernuus*
Cup Plant	*Silphium perfoliatum*
Golden Alexanders	*Zizia aurea*
Prairie Cord Grass	*Spartina pectinata*
Swamp Rose	*Rosa palustris*
Foxglove	*Penstemon digitalis*
Cardinal Flower	*Lobelia cardinalis*
Marsh Blazing Star	*Liatris spicata*
Rose Mallow	*Hibiscus sp.*
New England Aster	*Aster novae-angliae*

SLOPE STABALIZATION PLANTING MIX

Temporary Cover:

Common Name	Botanical Name
Redtop	*Agrostis alba*
Seed Oats	*Avena sativa*
Annual Rye	*Lolium multiflorum*
Timothy	*Phleum pretense*

Permanent Grasses:

Common Name	Botanical Name
Big Bluestem Grass	*Andopogon gerardii*
Little Bluestem Grass	*Andopogon scoparius*
Side-Oats Grama	*Bouteloua curtipendula*
Canada Wild Rye	*Elymus canadensis*
Switch Grass	*Panicum virgatum*
Indian Grass	*Sorghastrum nutans*

PRAIRIE PLANTING MIX

Permanent Grasses:

Common Name	**Botanical Name**
Big Bluestem Grass	*Andopogon gerardii*
Little Bluestem Grass	*Andopogon scoparius*
Side-Oats Grama	*Bouteloua curtipendula*
Canada Wild Rye	*Elymus canadensis*
Switch Grass	*Panicum virgatum*
Indian Grass	*Sorghastrum nutans*

Temporary Cover:

Common Name	**Botanical Name**
Seed Oats	*Avena sativa*
Annual Rye	*Lolium multiflorum*
Timothy	*Phleum pretense*

Forbs:

Common Name	**Botanical Name**
Wild Columbine	*Aquilegia canadensis*
Butterfly Weed	*Asclepias tuberosa*
New England Aster	*Aster novae-angliae*
Partridge Pea	*Cassia fasciculata*
Tall Coreopsis	*Coreopsis tripteris*
Broad-Leaved Purple Coneflower	*Echinacea purpurea*
Rattlesnake Master	*Eryngium yuccifolium*
Downy Sunflower	*Helianthus mollis*
False Sunflower	*Heliopsis helianthoides*
Round-Headed Bush Clover	*Lespedeza capitata*
Rough Blazing Star	*Liatris aspera*
Wild Bergamot	*Monarda fistulosa*
Purple Prairie Clover	*Petalostemum purpureum*
Common Mountain Mint	*Pycnanthemum virginianum*
Yellow Coneflower	*Ratibida pinnata*
Black-Eyed Susan	*Rudbeckia hirta*
Early Goldenrod	*Solidago juncea*
Hairy Tall Ironweed	*Vernonia altissima taeniotricha*